

mac / ran SYSTEM

a new concept in digital computer programs for random data

USER INFORMATION



MEASUREMENT ANALYSIS CORPORATION

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introduction

MAC/RAN* is a general package of digital computer programs developed by Measurement Analysis Corporation to provide a comprehensive analysis of time series (random) data. This type of data occurs routinely in such application areas as vibration, acoustics, oceanography, seismology, structural dynamics, biomedical research, and many other fields.

While time series analysis is not new, the combination of complete systems integration, newer and more powerful computation procedures, and overall ease of use make MAC/RAN a significant advance in this field.

The MAC/RAN System is written entirely in a version of ASA FORTRAN IV which is compatible with the major FORTRAN dialects. Care has been exercised to eliminate the use of operations peculiar to any one dialect or computer. This limitation has been imposed with minimal loss in program efficiency.

MAC/RAN consists of a set of seven computational modules designed around a system executive or monitor. Each of the computational processors is completely independent of the other modules, providing flexibility in the order of their use and also allowing the addition, deletion, or modification of any of them without affecting the others. Figure 1 is a diagram of the MAC/RAN System.

MAC/RAN PROCESSORS:

EXECUTIVE

CALIBRATION

DATA PREPARATION

AMPLITUDE STATISTICS

TIME AND FREQUENCY ANALYSIS

LINEAR SYSTEMS ANALYSIS

FAST FOURIER TRANSFORM

PRINT AND PLOT

ADD-ON CAPABILITY

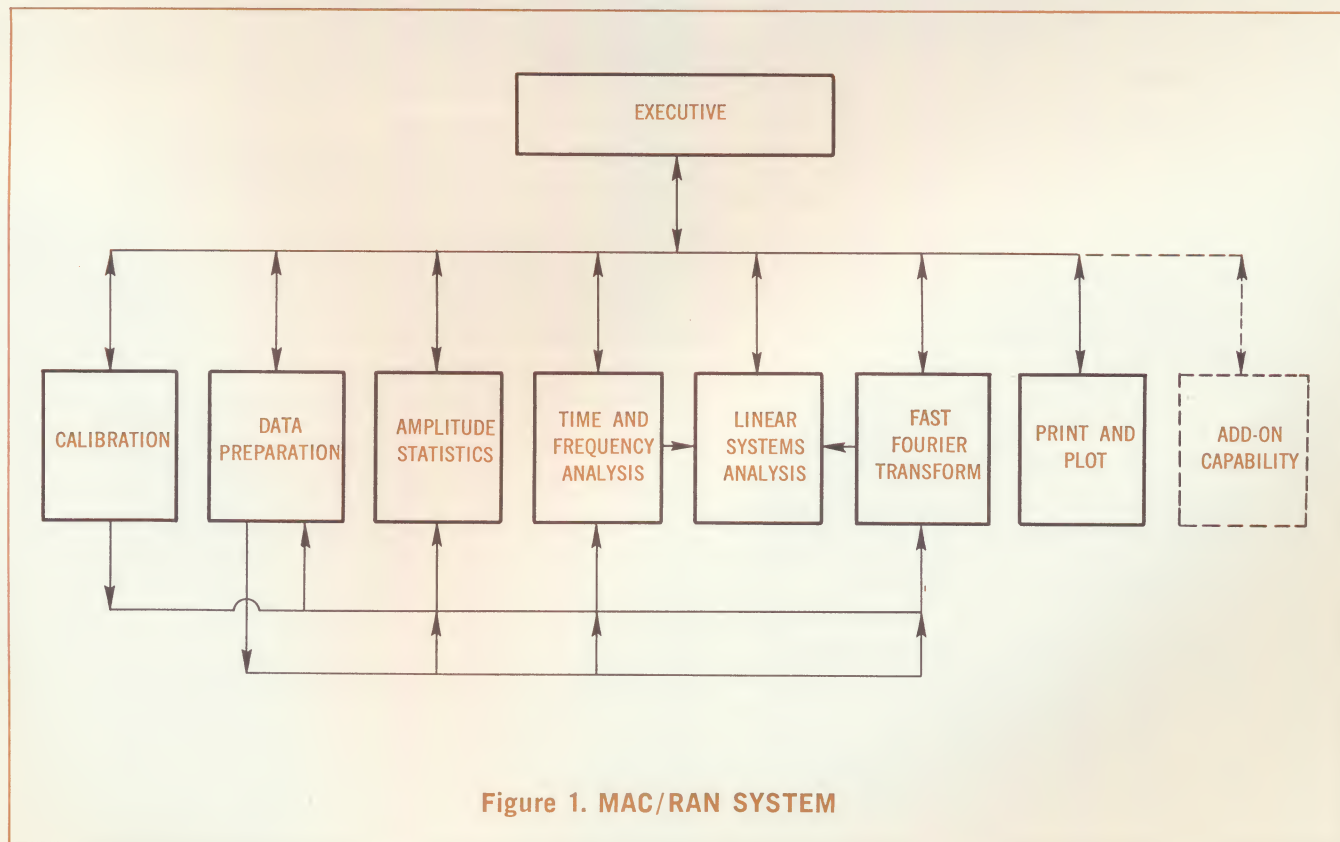


Figure 1. MAC/RAN SYSTEM

mac/ran application areas

Random data, also called time series data or stochastic data, refers to any data sample, regardless of its origin, which has no explicit mathematical formula but instead must be described in terms of probability statements and statistical averages. The MAC/RAN System provides needed digital computer programs for analyzing random data. Since a strong justification exists to consider much natural physical data as random, applications for MAC/RAN are quite extensive. Several typical MAC/RAN applications are listed below:

ACOUSTICS AND WAVE ANALYSIS

Sound transmission through various media, sonic fatigue of materials, and measurement of expected acoustical power are three examples in the field of acoustics where the MAC/RAN System provides useful answers. In fact, any wave form phenomenon which appears to be a combination of sine waves with varying amplitudes, frequencies, and/or phases, can be analyzed properly by means of the programs contained in MAC/RAN.

ASTRONOMY AND SPACE SCIENCES

There are many areas of research in astronomy, astrophysics, and the space sciences where large amounts of statistical data are being obtained at considerable expense. This includes research on such problems as radiation, absorption, perturbation, orbits, magnetic and gravitational fields, etc. Programs contained in MAC/RAN can be applied to data of this type to yield meaningful results.

AUTOMOTIVE SAFETY

Automobile suspension systems designed for shock and vibration isolation, road surfaces composed of different materials, and crash safety devices for handling impact shocks are three examples in the automotive field where tests are conducted under severe environmental and operational conditions. Data obtained from such tests can be analyzed more realistically now than in the past by using the various processors contained in MAC/RAN, thereby leading to improvements in automobile safety and comfort.

BIOMEDICAL RESEARCH

The analyses of various electrical signals from the body, such as electroencephalogram and electrocardiogram data, can be enhanced by filtering techniques, correlation detection techniques, and coherence techniques which are incorporated in MAC/RAN. These results can be used to develop better diagnostic procedures, to determine the presence or absence of certain abnormalities, and to measure the effects of various treatments. MAC/RAN can also analyze large amounts of medical data from clinical records to determine the statistical significance or influence of various parameters.

COMMUNICATION SYSTEMS

Improvements in commercial and military communication systems are being achieved through better separation of signals and noise using optimum filtering techniques. New communication systems can be developed and tested with the aid of programs available in MAC/RAN to determine how effectively they satisfy optimum performance requirements under various expected situations. Existing systems can be more thoroughly analyzed than ever before.

DESIGN AND TEST SPECIFICATIONS

Improved techniques for deriving acoustic, shock, and random vibration design and test specifications for spacecraft and aircraft are being achieved through better understanding of required measuring equipment, parameter estimation, and engineering procedures. The MAC/RAN System implements the latest computational techniques to obtain needed quantitative information about environmental data for specifications, as well as indicate the statistical errors contained in the computations.

GROUND AND FLIGHT TESTS

Stationary and nonstationary random data regarding acoustic, shock, vibration, buffet, flutter, and aerodynamic noise environments collected during ground and flight tests can be evaluated in appropriate ways (depending upon the desired application) using the MAC/RAN processors. For example, detailed knowledge of the spectral content of forcing functions, or responses to forcing functions, is valuable to determine whether or not critical resonances are occurring or could occur in components, structures, or equipments which would result in adverse results.

METEOROLOGY

By its very nature, meteorological data represents one of the largest sources of random data being collected. Weather data at various localities and at different seasons exhibit ever changing forms whose statistical properties can be interpreted properly by means of the comprehensive computational procedures incorporated in MAC/RAN. The large quantities of meteorological data already available can be compiled and analyzed extensively for new knowledge using MAC/RAN.

NUCLEAR POWER

Random noise generated by nuclear reactors contains significant information concerning the reactor's performance. This noise can be studied in great detail using the Amplitude Statistics Processor and the other processors in MAC/RAN. Monitoring levels can be established to prevent an extreme condition from occurring. Parameters can be computed to compare quantitatively the effects of new designs or new control procedures.

OCEANOGRAPHY AND UNDERSEA TECHNOLOGY

Ocean wave behavior represents a typical random process occurring in both space and time. Important features in this data can be analyzed in many special ways using MAC/RAN and the results applied to ocean wave prediction, hydrodynamic vibrations, ship silencing, and other problems. Related areas of investigation are underwater acoustics, sonar, and bathysphere development.

PSYCHOLOGICAL RESEARCH

Large amounts of data obtained during psychological tests and measurements must be analyzed using statistical techniques to determine correlations, variability, reliability, and relationships between parameters. The programs contained in MAC/RAN can be used to process, with optimum efficiency, the data obtained from such programs, and also in planning psychological tests to give the maximum amount of usable statistical information.

SEISMOLOGY AND OIL EXPLORATION

The enhancement of seismic signal information in a seismic array depends upon knowledge of the noise field within the array. Multiple coherence function programs available in MAC/RAN in the Linear Systems Analysis Processor can be used to determine properties of the noise so as to indicate how many seismometers are needed, and what improvements are possible by multichannel filtering. These methods are also directly applicable to analyzing data for oil exploration.

STRUCTURAL DYNAMICS

The response of structures to random excitation (dynamic forces, shock, vibration, acoustics) can be analyzed with the aid of MAC/RAN processors. MAC/RAN programs are useful for investigating transmission properties of complicated systems where multiple input/output linear models are known to be applicable. Results obtained can be applied towards establishing structural design criteria and for predicting structural failures under random excitation.

EXECUTIVE PROCESSOR

The Executive Processor provides overall system control and also contains all input/output capabilities. In this way, all interface areas, both external and internal to the system, are handled by an Executive subroutine. Calls are made to the Executive by the other processors when requesting either control parameter or data inputs, or when producing various outputs. Comprehensive plotting capability utilizing manufacturer-supplied plotting software is available with the Executive. By means of this approach, a change in digital plotters requires only that the new manufacturer-supplied software be inserted to replace the existing software. No changes in the processor modules are required.

All control parameters are supplied on fixed field punched cards in order to minimize setup errors. Parameters supplied to the Executive define the job data flow both as to the data to be processed and the peripheral units to be used. Processor parameters are used in controlling the calculations to be performed. Control input is kept to a minimum by pre-setting as many parameters as possible with standard values. The user must then supply only

those parameters which cannot be preset and replacements for any standard values to be overridden. Standard parameters can be preset during installation of the MAC/RAN System to conform to normal user requests.

All data processed by MAC/RAN must be supplied in a Standard Intermediate Data Tape Format, described in this brochure and in the MAC/RAN Program Reference Manual. This format is used for all data, either read or recorded by the various modules. Finally, the Executive maintains a directory of all data being processed which is produced on punched cards at the end of each computer run. The directory contains relevant statistical and locational information for each channel of data, providing the user with a quick check on the status of analyses being performed and the data being retained.

MAC/RAN utilizes the overlay feature of FORTRAN IV to select the required sequence of computations. All processor modules are maintained on the overlay unit and called as needed. As a result of this, only the Executive and one processor are resident in memory at any given time, thus providing optimum use of computer memory. Typical MAC/RAN Executive data flow is illustrated in Figure 2.

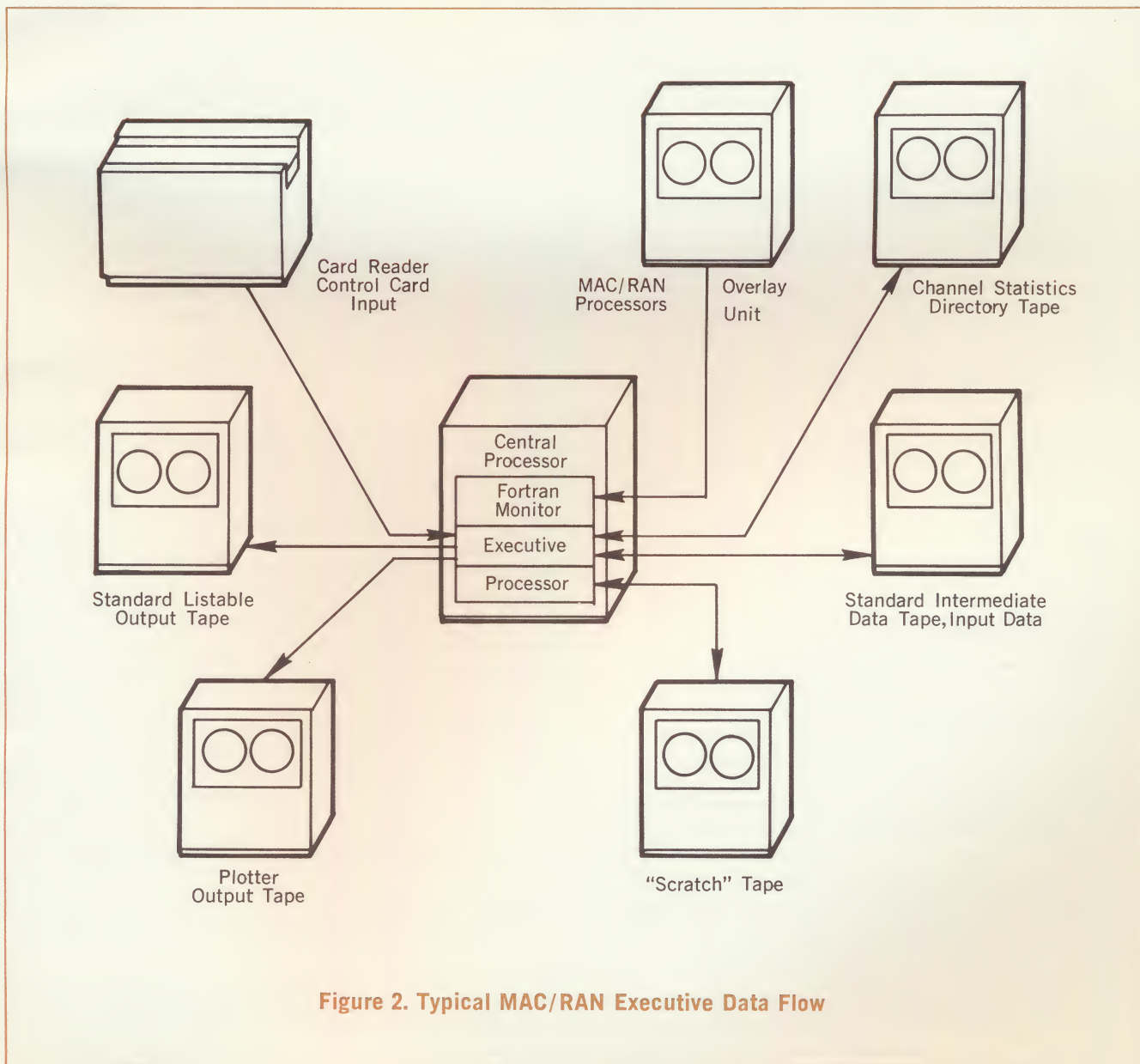


Figure 2. Typical MAC/RAN Executive Data Flow

CALIBRATION PROCESSOR

The Calibration Processor performs a conversion of data from normal digitizer units to actual physical or engineering units. This processor requires its inputs to be in the Standard Intermediate Data Tape Format. If this is not true, as will be the case in many instances, then a program to do this format conversion must be supplied. Separate arrangements can be made with Measurement Analysis Corporation to provide this program as an extra processor module for MAC/RAN. Often, existing programs at a given installation for handling digitized data can easily be modified to output the required format.

Two types of calibrations may be performed. Each is relatively standard in engineering practice. The first of these is a step calibration where levels corresponding to known physical values of the data have been recorded. A table of these levels in digitizer units versus their corresponding physical unit values is generated and used to perform that data conversion. The second type of calibration requires the recording of a sinewave at a fixed amplitude which corresponds to a known value in physical units. The processor calculates the corresponding amplitude in digitizer units and utilizes this information in performing the data conversion.

This processor operates in a parallel mode, allowing the conversion of many data channels to be performed simultaneously. Results may be displayed using the Print and Plot Processor.

DATA PREPARATION PROCESSOR

The Data Preparation Processor performs three basic operations:

1. Trend removal.
2. Numerical filtering.
3. Decimation.

The first of these operations is concerned with the removal of low frequency data components whose periods are longer than the length of the data to be analyzed. Such components can be caused by transducer drifts or other types of errors, or may actually be valid. In any case, these components can give rise to biased estimates of power and cross-spectra. A low degree (1st through 4th) polynomial curve fit to the data is generated by a least squares procedure. This polynomial is evaluated at each sample and subtracted from the data. If the polynomial degree has been chosen appropriately, the trend will be removed with minimal effect on the information of interest.

The second operation involves the frequency-limiting of the data to only those spectral regions of interest. Various types of recursive or feedback digital filters with selectable pass band characteristics, similar in nature to analog filters, are available to the user. Low-pass, high-pass and band-pass filters, as well as two special types known as RC or Markov and single tuned filters, may be designated. Center frequencies, bandwidths and slope or rolloff characteristics are under user control. Rolloffs for the high- and low-pass filters may be as much as 30 db/octave.

The final operation performed by this processor is data sequence decimation. This consists of the removal of redundant information by the retention of only a subset of the original data sequence. As can be shown by the well

known sampling theorem for band limited functions, the data sampling rate need be no more than twice the highest frequency component of the data. If the data has been sampled at too high a rate initially, or if the data frequency content has been reduced by filtering, then decimation should be performed to speed up subsequent computations.

This processor operates in a parallel manner allowing many data channels to be prepared simultaneously. Results may be displayed using the Print and Plot Processor.

AMPLITUDE STATISTICS PROCESSOR

The Amplitude Statistics Processor provides estimates of the probability density function and probability distribution function of a given data sequence. In addition, other sample statistics such as the mean, and first through fourth moments about both zero and the mean are calculated. Amplitude ranges and class interval widths may be computed by the processor eliminating the need for detailed knowledge about the data by the user. The standard chi-square goodness-of-fit test for normality is applied to the probability density function to determine if the data sequence is normally distributed. A plot of the sample probability density function overlaid with the normal or Gaussian probability density function is supplied as a major output.

This processor operates in a parallel manner so that many data sequences may be analyzed simultaneously. A typical plot appears in Figure 3.

TIME AND FREQUENCY ANALYSIS PROCESSOR

The Time and Frequency Analysis Processor performs a standard Blackman-Tukey type of spectral analysis on one or more data sequences. This procedure consists of computing correlation functions from the data sequences and then taking Fourier transforms to generate spectral density estimates.

Options for many computations are available to the user. It is possible to specify calculations for any of the following:

1. Autocorrelation
2. Cross-correlation
3. Auto and cross-correlation
4. Autocorrelation and power spectral density
5. Cross-correlation and cross-spectral density
6. Autocorrelation, power spectral density, cross-correlation and cross-spectral density
7. Multi-channel spectral analysis

The last option provides for the calculation of all possible power and cross-spectra between a set of two or more specified data sequences.

In computing the correlation function, the sample mean is always removed. Also, it is possible to normalize the correlation functions with respect to the sample variances. Other options include a choice of either the Tukey-Hanning or Parzen spectral windows for smoothing the spectral estimates. The cross-spectra are computed both in terms of real (co-spectra) and imaginary part (quad-spectra), or in terms of modulus and phase.



FIGURE 7
REAL PART OF CROSS SPECTRAL DENSITY OF
CHANL 7, CHANL 3

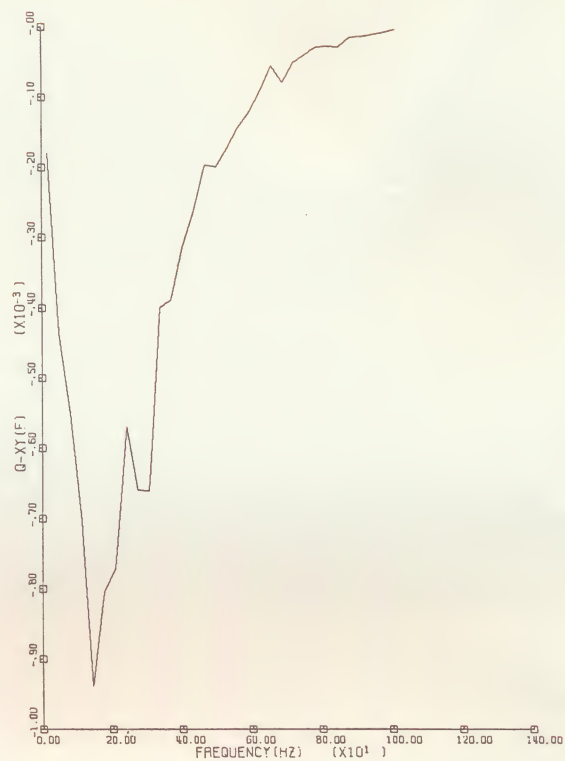


FIGURE 8
IMAGINARY PART OF CROSS SPECTRAL
DENSITY OF CHANL 7, CHANL 3



FIGURE 9
MODULUS OF CROSS SPECTRAL DENSITY
OF CHANL 7, CHANL 3

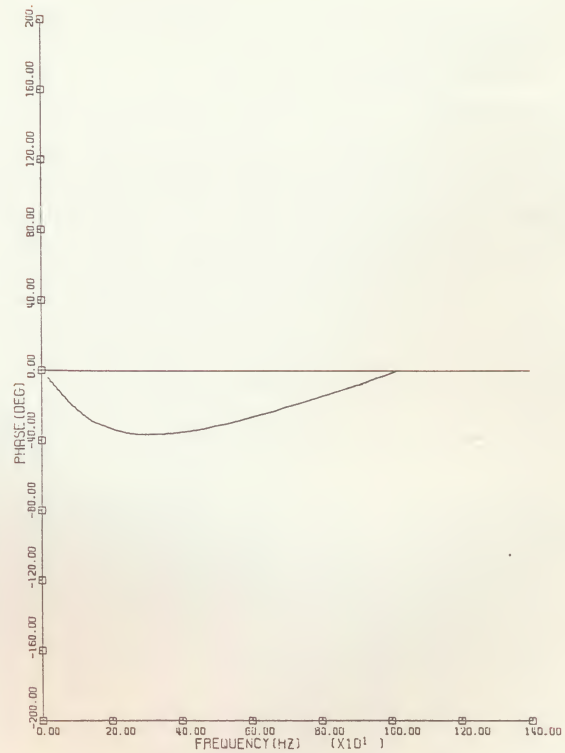


FIGURE 10
PHASE OF CROSS SPECTRAL DENSITY OF
CHANL 7, CHANL 3

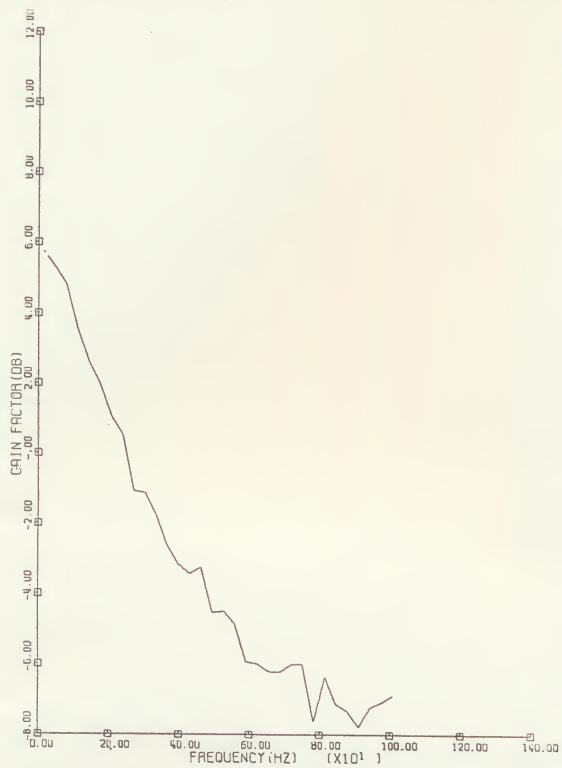


FIGURE 11
GAIN FACTOR OF FREQUENCY RESPONSE
FUNCTION FOR CHANL 2

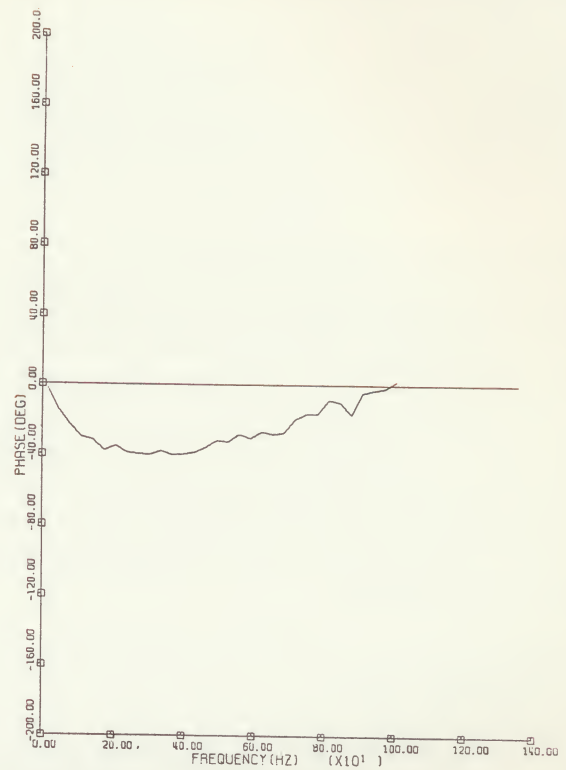


FIGURE 12
PHASE FACTOR OF FREQUENCY RESPONSE
FUNCTION FOR CHANL 2

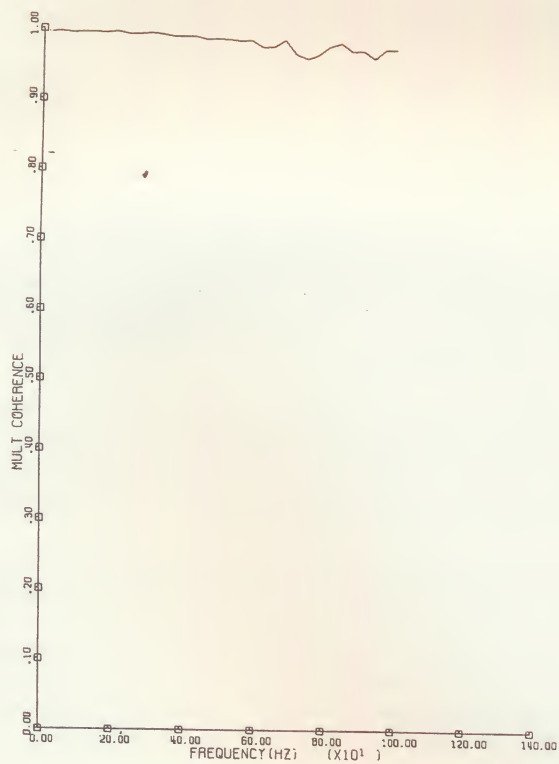


FIGURE 13
MULTIPLE COHERENCE FUNCTION

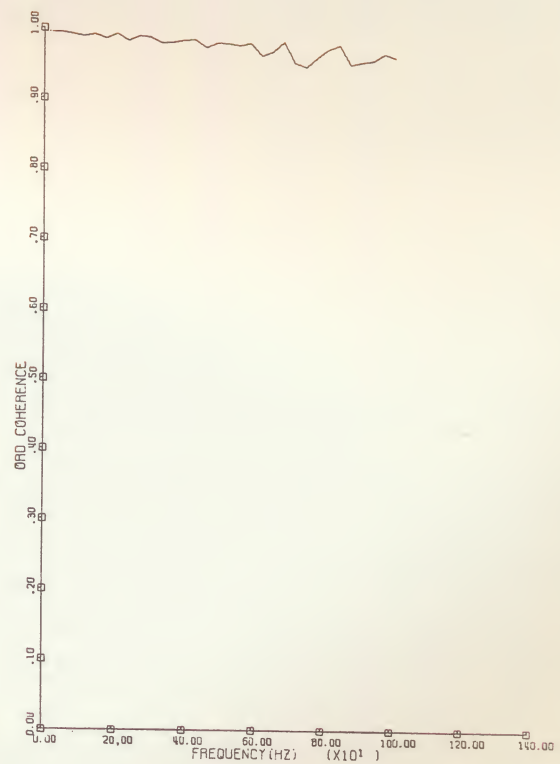


FIGURE 14
ORDINARY COHERENCE FUNCTION
FOR CHANL 2

Outputs include a comprehensive set of plots of the calculated functions. Plotting scales may be selected by the user, or the processor will generate reasonable scales based on the function ranges. Options are available for providing plots of the spectral estimates in physical units or decibels. Log or semi-log plots may also be selected by the user. Typical plots appear in Figures 4 through 10.

LINEAR SYSTEMS ANALYSIS PROCESSOR

The Linear Systems Analysis Processor provides the capability for performing a complete frequency domain analysis of a multi-channel linear system. Required spectral density information may be generated either from the Time and Frequency Analysis Processor or from the Fast Fourier Transform Processor. One data channel is selected as the output or reference channel and the others are designated as inputs. Multi-channel frequency response functions between all the input channels and the output channel are calculated both in terms of real and imaginary parts or gain and phase factors. Associated confidence bands are also calculated.

Coherence functions of several types are provided. Ordinary coherences, which relate the linearity of any one data channel with respect to any other channel, are computed between all data channels. The multiple coherence function which specifies the percent of total power in the output or reference channel which may be accounted for by a linear combination of the input channels is also calculated. Finally, partial or conditional coherence functions between each of the input channels and the output channel are computed. This type of coherence defines the linearity between any one input and the output when the linear effects of all other inputs have been removed. Confidence bands are provided for each coherence function.

Plots of the various quantities calculated are available as the major output from the processor. Samples of plots generated from a typical three input-single output system appear in Figures 11 through 15.

FAST FOURIER TRANSFORM PROCESSOR

The Fast Fourier Transform Processor implements the so-called "Cooley-Tukey" algorithm in order to perform spectral analyses. The processor utilizes data sequences with a sample length N equal to 2^p . If N is not an integral power of 2, then the sequence may be either truncated or padded with zeros to provide an appropriate length.

The time series is tapered and then Fourier transformed. The tapering procedure is analogous to the smoothing performed on a correlation function by means of a spectral window. The Fourier transform of the time series may be specified as the output required, or power and/or cross-spectral densities may be requested. Either one or two data sequences may be processed at the same time, thus providing cross-spectrum capabilities. A multi-channel option similar to the one available in the Time and Frequency Analysis Processor is also provided.

Resolution bandwidth may be specified by the user down to the minimum defined by the reciprocal of the record length. The processor will adjust the analysis to the required bandwidth by appropriate averaging of the Fourier transforms which are calculated at the finest possible frequency resolution.

Computation of power and cross-spectra by means of this processor will usually require significantly less computer time than the Blackman-Tukey method. The speed ratio between the two methods for computing one power spectrum may be defined by $m/4p$ where m is the number of autocorrelation lag values and p is the power of 2. If power spectra of two channels are to be calculated, then the speed ratio will double, since two power spectra can be calculated simultaneously by the Fast Fourier Transform method. Also, if a cross-spectrum is required as well as the two power spectra, then the speed ratio will be increased by a factor of four. While the ratio may show an increase in speed of several orders of magnitude for a reasonable computation, the actual difference in total computer time is reduced by the fact that system overhead for such items as data input and output must be considered. Typical increases in speed range from factors of five to twenty.

Samples of plots generated by this processor appear in Figures 16 through 20.

PRINT AND PLOT PROCESSOR

The Print and Plot Processor is provided as an adjunct to the other processors. Its primary purpose is to provide listings and/or plots of time histories (data sequences) used by the various processors. For example, a plot of the calibrated data generated by the Calibration Processor may be of interest to the user but none is supplied by the processor. By means of the Print and Plot Processor, it may be produced. Also, cross plotting and cross tabulation of data may be supplied.

The processing is performed in parallel on any number of data sequences. Sample plots generated by this processor appear in Figures 21 and 22.

ADD-ON CAPABILITY

Many of the more difficult tasks entailed in writing a computer program are those concerned with input/output and program organization. The MAC/RAN System eliminates the need to concern oneself with these problems by the inclusion in the Executive of all necessary subroutines to perform these tasks.

A typical processor module consists basically of a series of statements defining the computations being performed, surrounded by Executive subroutine calls for supplying the control and data inputs, together with the required hard copy and tape or disc outputs.

Dummy modules in the MAC/RAN System may be replaced by additional processors as needed. Information required for generating a new module is contained in the Program Reference Manual supplied with the MAC/RAN System. New processor modules desired for special applications may be programmed either by the user or by Measurement Analysis Corporation under a separate contract.

It is anticipated that new processors of general interest will be generated by Measurement Analysis Corporation in the future. Lessees of the MAC/RAN System will be given the opportunity to add these modules to their system at a modest cost.

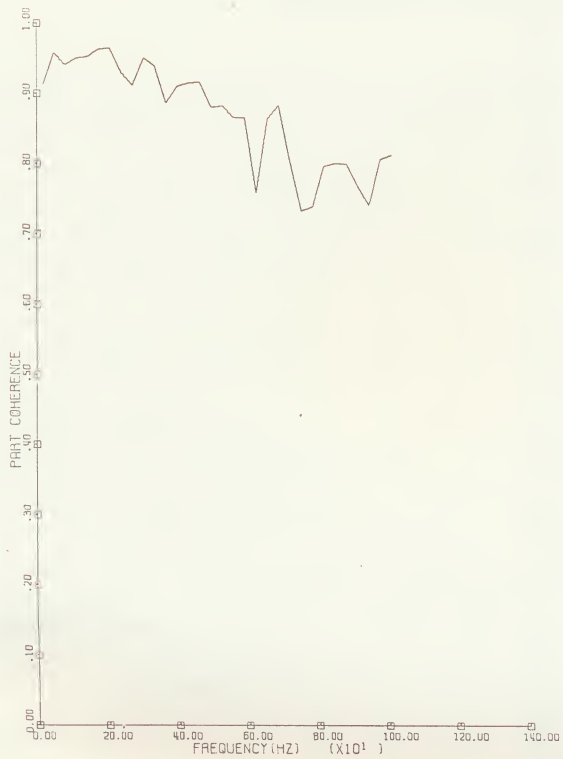


FIGURE 15
PARTIAL COHERENCE FUNCTION
FOR CHANL 2



FIGURE 16
POWER SPECTRAL DENSITY FUNCTION
OF CHANL 2

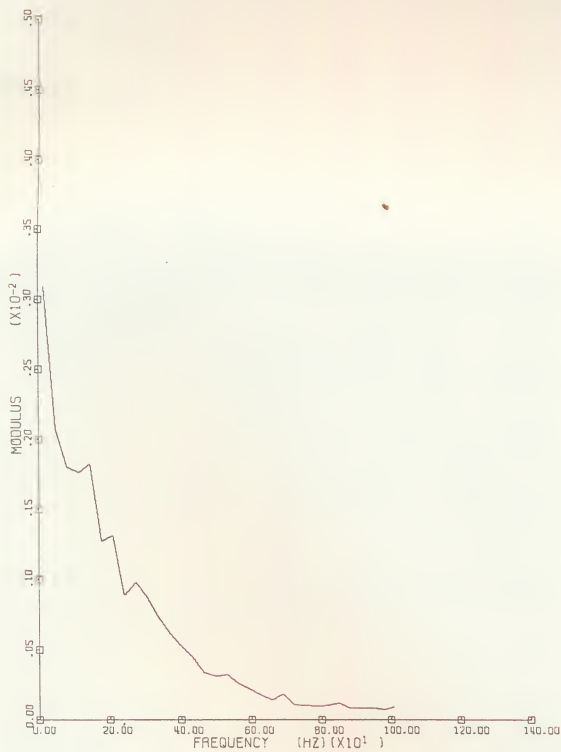


FIGURE 17
MODULUS OF CROSS SPECTRAL DENSITY
FUNCTION OF CHANL 8, CHANL 2

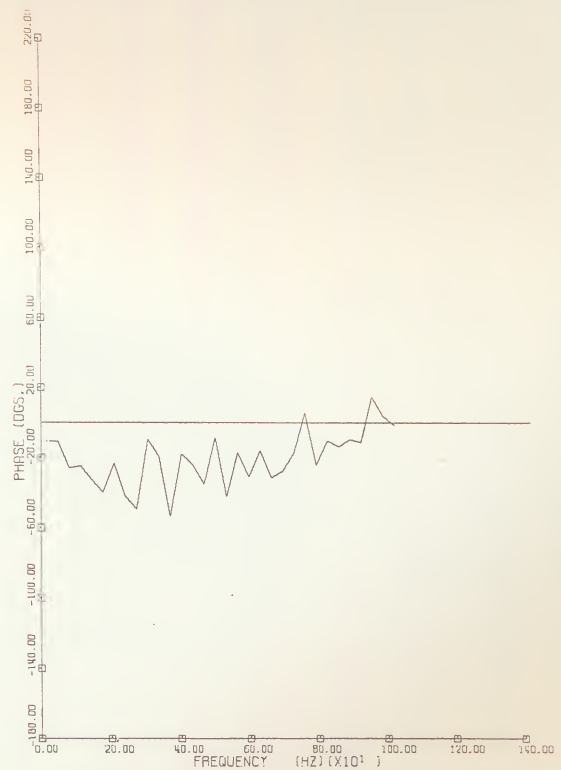


FIGURE 18
PHASE OF CROSS SPECTRAL DENSITY
FUNCTION OF CHANL 8, CHANL 2

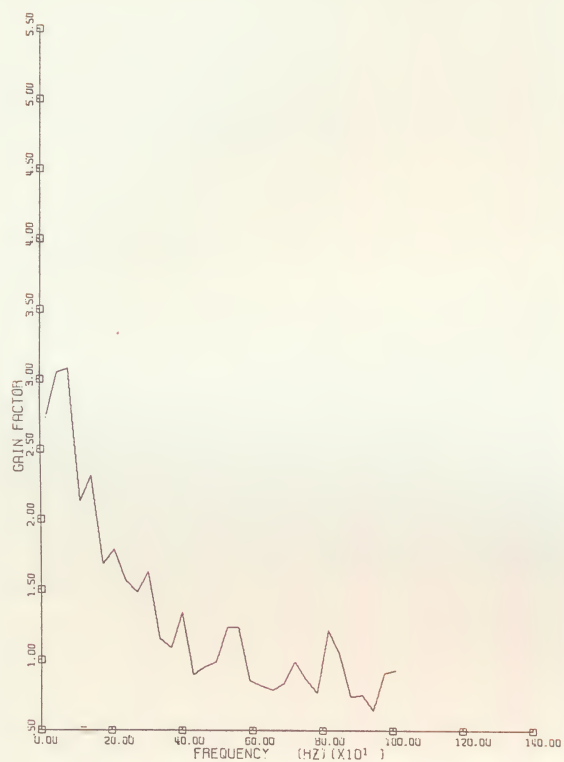


FIGURE 19
GAIN FACTOR OF FREQUENCY RESPONSE
FUNCTION OF CHANL 8, CHANL 2

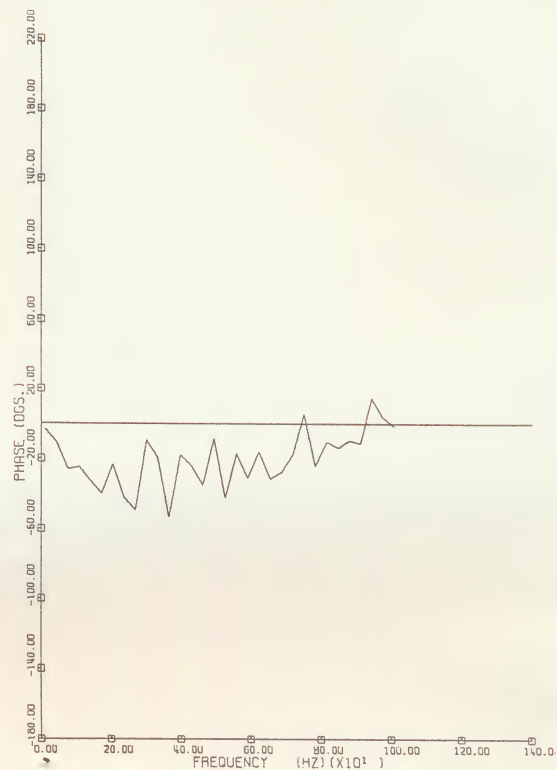


FIGURE 20
PHASE FACTOR OF FREQUENCY RESPONSE
FUNCTION OF CHANL 8, CHANL 2

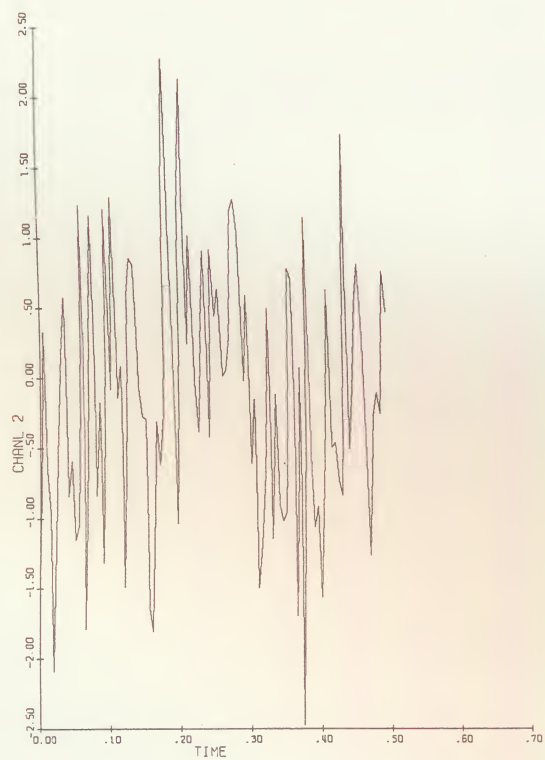


FIGURE 21
TIME HISTORY OF CHANL 2

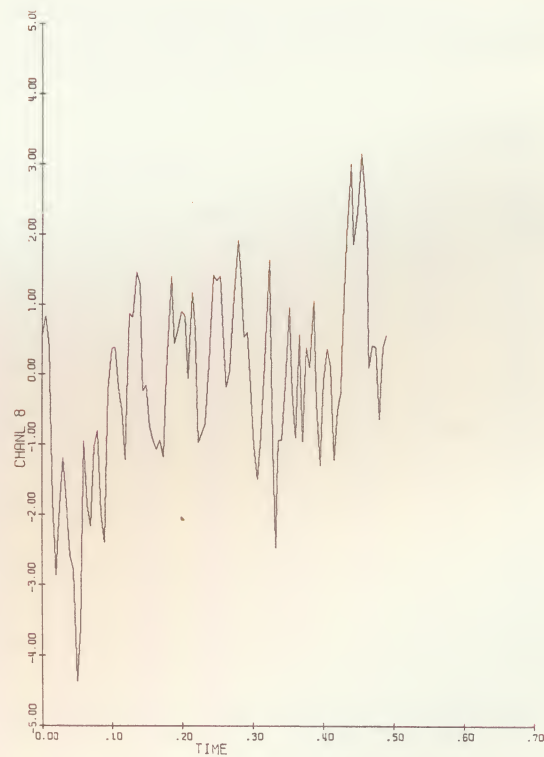


FIGURE 22
TIME HISTORY OF CHANL 8

standard intermediate data tape format

All data tapes generated by the MAC/RAN System are written in FORTRAN compatible format: that is, with records of predeterminable length and with no interspersed end-of-file marks. All data on the tape is written in the form of FORTRAN REAL variables (single precision, floating point). Complex or double precision variables will be written as a pair of REAL variables.

All records will be recorded in the *binary* mode in the highest practicable packing density. The first word of each record is reserved for a logical end-of-file signal word which is zero for all except the last record of each logical file. In the last record of each file, this signal word contains the count (integer form) of the number of records in the file (including the last record).

The data is in what is normally termed as "multiplexed" format. That is, for a single given value of time, several channels of data occur in sequence.

Each tape will contain the following three types of logical files:

(1) Tape ID File

The first file on each tape consists of one 15-word record containing the tape reel number and alphanumeric tape identification.

Word 1 contains the integer one (1) to designate one record in tape file one.

Word 2 contains the integer one (1) to indicate tape file one.

Word 3 contains the tape reel number in integer form.

Words 4 through 15 contain, starting left justified in word 4, 12 words of BCI information to serve as tape identification.

(2) Data Files

The N logical data files on each tape appear as files 2 through N + 1. Each data file is formatted as follows.

a. Record 1 — Data File ID Record

Word 1 — Zero (logical end-of-file signal word).

Word 2 — File number, in integer form.

Words 3 and 4 — Type of Data (time history, psd's, etc.) alphanumeric integer form.

Words 5 and 6 — Data Source (vibration data, oceanographic data, etc.) alphanumeric integer form.

Word 7 — Number of words per frame in this data file, in integer form.

b. Record 2 — Variable ID Record

Word 1 — Zero (logical end-of-file signal word).

Words 2 and 3 — Independent Variable Identifier (time, frequency, etc.) in alphanumeric integer form.

Words 4 and 5 — First Dependent Variable Identifier.

Words $2p + 1$ and $2p + 2$ — Last Dependent Variable Identifier.

NOTE: Identifiers for double precision or complex variables will occupy four words.

c. Data Records

All other records in the data file are of fixed length (as determined by the frame size) and contain the logical end-of-file signal word as the first word, followed by data words. For frame lengths of 20 or less, each record contains 10 frames of data. For frame lengths greater than 20, each record contains one frame only. Thus, the maximum size of multiple frame records is 201 words. The first sample (channel) in each data frame is a real value of the independent variable, followed by samples of the dependent variables in the order defined by the identifiers in Record 2 of the file. To satisfy the FORTRAN requirements for predeterminable length records, the last record of each data file will be completed with filler consisting of all binary ones (i.e., 11111.....111) when required.

(3) End-of-Tape File

File N + 2 follows the last data file on tape, and designates the logical end-of-tape. The file consists of one record composed as follows:

Word 1 — Non-zero (logical end-of-file signal word).

Word 2 — File number (N + 2) in integer form.

Words 3 through 7 — The characters "END-OF-FILE" in alphanumeric integer form, followed by sufficient blank characters to complete the record, starting left adjusted in Word 3.

(4) The End-of-Tape File is followed by a physical end-of-file mark.

computer requirements

The MAC/RAN System is usable on any medium-to-large scale digital computer having an appropriate FORTRAN compiler and sufficient memory and peripheral units available.

Word size requirement is to a large extent dependent on the FORTRAN compiler used. Since a majority of the computations are performed in single precision with real variables, the word length used by the compiler must be able to maintain at least 20 binary digits significance. A less stringent requirement imposed by MAC/RAN is that the computer word be of sufficient size to contain a minimum of four characters.

Internal memory requirements will vary with both the FORTRAN compiler and operating system used. A minimum requirement of 32,768 words of memory is a reasonable expectation.

Peripheral units are required to maintain both the data being processed and the MAC/RAN System itself. At least the following units must be available in addition to any units used by the operating system:

- One system overlay unit
- One unit for maintaining a data directory
- Two or more data input/output units
- One plotting output unit (if off-line plotting is used)

These units will normally be tape drives. However, either disc or drum may be substituted for some tapes provided the operating system has the capability of using these various units interchangeably. Additional units may be employed if available.

Typical computers acceptable for the MAC/RAN System are:

- IBM 7040/44, 709/90/94, 360-40 and above
- CDC 1604, 3200, 3400, 3600, 6400, 6600
- UNIVAC 1107, 1108
- SDS 9300, 940, SIGMA 5, SIGMA 7
- RCA SPECTRA 70-35, 45, 55
- GE 625, 635, 645

contractual arrangements

The MAC/RAN System, including computer installation, Program Reference Manuals, and on-site instruction in its use, is available only on a ten year lease basis. The lease provides protection of MAC's proprietary rights and also benefits the lessee by keeping him informed about changes in the MAC/RAN System. The total price (payable upon installation of the MAC/RAN System) allows for the unlimited use of the MAC/RAN System on one specific computer at the installation designated for the entire ten year period. A supplemental agreement must be negotiated with Measurement Analysis Corporation for the use of the MAC/RAN System on additional computers at either the same or different installations.

TECHNICAL SERVICES

Special arrangements can be made for the processing of sample data tapes supplied by potential lessees at a negotiated price. To do this conveniently, data tapes should be written in the MAC/RAN System Standard Intermediate Data Tape Format. Technical services on the proper use of MAC/RAN and the interpretation of results for various applications represent areas of assistance offered by Measurement Analysis Corporation personnel. Additional software support is also available at reasonable cost.

FURTHER INFORMATION

For further information regarding the MAC/RAN System, telephone L. D. Enochson, Vice President, at (213) 477-4555 or write to:

Measurement Analysis Corporation
10960 Santa Monica Boulevard
Los Angeles, California 90025